ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 2. 1906.

IV.—REVISION OF THE GENUS HEMILEIA, BERK.

(*With Plate.*)

The discovery of two additional species of *Hemileia* has rendered necessary a redescription of all known species included in the genus, which up to the present have been very inadequately described in systematic works, the uredo-spore phase alone being mentioned.

It is somewhat remarkable that no attempt appears to have been made by those engaged in studying the life-history of *Hemileia vastastrix*, Berk. and Broome, the cause of the much dreaded coffee-leaf disease in Ceylon and elsewhere, to ascertain whether or not an Aecidium condition existed ; the presence of both uredo- and teleuto-spore stages strongly suggesting the probability of the presence of such.

This probability receives further support from the fact that there exist four species of *Aecidium* as yet not correlated with uredo- or teleuto-spore stages, parasitic on the same or closely allied plants as those on which the various species of *Hemileia* are parasitic, and also occurring in the same countries as the latter. These species are as follows :—

Aecidium Vangueriae, Cooke, on *Vangueria infausta*, Burch, and *V. latifolia*, Sond., Natal. "Often on the same plant, sometimes on the same leaves as *Hemileia Woodii*, K. & C." (Cooke, Grevillea, x. p. 124.)

Aecidium Pavettae, Berk. and Broome, and *A. flavidum*, Berk. and Broome, on *Pavetta indica*, L. ; Ceylon.

Aecidium Plectroniae, Cooke, on *Plectronia Cueinzii*, J. M. Wood, Natal.

Should heteroecism be proved to exist in the genus, the fact would be of value in any attempt to arrest the extension of parasitic species.

Two species, *Hemileia vastatrix*, Berk. and Broome, and *H. Woodii*, Kalchbr. and Cooke, are now known as parasites on

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species of *Coffea*, and as these species are shown to be parasitic on several other rubiaceous plants belonging to different genera, which have an extended geographical range, their distribution should be carefully studied by those interested in the culture of coffee. The establishment of a coffee plantation in a district where those species of *Hemileia* capable of infecting coffee are present on indigenous vegetation, would be tempting providence, and probably result in disaster.

Hemileia vastatrix, Berk. and Broome, has not been collected on *Coffea arabica*, L., nor on *C. liberica*, Hiern, when growing wild, but it is recorded as occurring on *Coffea arabica*, L., var. *Stuhlmannii*, Warb., by Hennings,* who writes as follows :—

"Auch *Hemileia vastatrix* ist jedenfalls in Afrika ursprünglich und von hier in die verschiedensten Tropenländer verschleppt worden. Auf Blättern von Coffea arabica var. Stuhlmannii Warb., am Victoria Nyanza bei Bukoba von Dr. Stuhlmann im März 1897, gesammelt, wurde von Dr. Warburg gleichfalls dieser Pilz beobachtet, woraus mit Sicherheit hervorgeht, dass diese Kaffeeblattkrankheit nicht erst durch von den Europäern eingeführte Kaffeesaat nach Deutsch-Ost-Afrika gekommen ist."

It is not at all necessary to assume that the coffee disease has been imported along with the coffee plant from one country to another, taking into consideration the wide distribution of different species of plants attacked by *Hemileia vastatrix*, Berk. and Broome, or *H. Woodii*, Kalchbr. and Cooke; both of which are capable of infecting species of *Coffea*.

Indigenous plants attacked by one or other of the above-mentioned species of *Hemileia* are distributed as follows :—

Ceylon, *Plectronia campanulata*, Beddome, *Coffea travancorensis*, Wight and Arn.; Southern India, *Coffea travancorensis*, Wight and Arn.; China, *Gardenia jasminoides*, Ellis; Java, *Gardenia*, two spp. undetermined; Africa, *Coffea arabica*, L. var. *Stuhlmannii*, Warb., *Craterispermum laurinum*, Benth., *Vangueria infausta*, Burch., *V. latifolia*, Sond., *V. euonymoides*, Schweinf., *V. madagascarensis*, J. F. Gmel; Queensland, *Gardenia edulis*, F. v. Muell.

The wide geographical range of the genus *Hemileia* is further illustrated by the discovery of a species parasitic on an orchid—*Cattleya dowiana*, Batem., from Costa Rica. Repeated experiments prove that the spores of this species will not inoculate the coffee plant.

Preventive measures against Hemileia.—Until the life history of the fungus is known preventive means can only be followed on the rule-of-thumb system; in other words the fungus cannot be attacked at the most vulnerable point during its development.

Marshall Ward has shown that the uredo-spores, when placed on the surface of a coffee leaf, germinate, the germ-tube enters the tissues of the leaf, and in about a fortnight's time the disease

* Zeit. Trop. Landw. der Tropenpflanzer, No. 8, 1897, p. 192.

appears. As to whether the secondary spores borne on the promycelium of germinating teleutospores can directly inoculate a coffee leaf is not known, probably not ; at least I have determined that the secondary spores of *Hemileia americana* cannot inoculate the host that produces uredospores. The question then arises, which species of plant is inoculated by the secondary spores ? Finally, does an *Aecidium* stage exist ? As already stated there is evidence in favour of its existence ; again, if so, on what host-plant does it occur ? All these doubtful points must be definitely settled before we can hope to successfully combat and exterminate the disease.

In the meantime, as usual in the Uredineae, the epidemic or rapid spread of the disease is due to the uredospore stage of the fungus. In places where the nature of the ground and other circumstances admit of spraying, Bordeaux mixture is the most effective fungicide to use. The mixture should be only half the normal strength, otherwise the youngest foliage suffers.

A cyclone nozzle should be used as a very fine spray is necessary, otherwise the mixture accumulates into minute drops, and rolls off the smooth surface of the leaf. A quantity of blood serum dissolved and added to the fungicide causes it to adhere better to the surface of the leaf.

Diseased fallen leaves should be collected and burned, otherwise the teleutospores which mostly mature after the uredospores, are dispersed far and wide on the dry leaves, and in due course infect indigenous plants, the resulting crop of uredospores in turn attacking the cultivated coffee.

The following note by Balansa,* a well known botanical collector, on a method of cultivating coffee which enabled it to resist the disease, as practised in Tonkin, on the slopes of Mount Bavi, near Tu-Phap, at an elevation of about 1,600 feet, is of interest.

" Il y a quelques mois je vous a fait parvenir des feuilles de caféier attaquées par *l'Hemileia*. Vous en désiriez de plus caractérisées. Les voici. *l'Hemileia* a déjà fait d'assez grands ravages dans deux de nos champs d'essai, mais dans un troisiéme occupant un petit plateaux argileux, les caféiers qui étaièntt infectés du parasite quand je les ai transplantés, en sont, actuellement tout à fait débarrassès. Il faut vous dire qu'ils sont en plein soleil, sans abri, et qu'ils ont même un peu souffert des insolations. Je compte beaucoup sur eux. Si mis espérances se réalisent, il en résulterait qu'on a bien tort dans certains pays, de planter les caféiers sous des arbres, c'est la plus sûr moyen de propager la maladie.

HEMILEIA, *Berk. and Broome* (emended).

I. (Aecidium stage). Unknown.

II. (Uredo stage). Forming effused pulverulent, orange patches on the under surface of living leaves, or on young shoots and fruit ; uredospores grouped in small heads or clusters, produced at

* C. Roumeguère Fung. Sel. Exs., No. 4,500.

the apex of fascicles of hyphæ emerging through the stomata, reniform or subglobose, the whole or a portion only of the epispore warted ; germ-pores 3–5.

III. (Teleutospore stage). Teleutospores originating from the centre of the heads of uredospores after the latter are fully developed, unicellular, broadly ovate, umbonate ; germ-pore apical ; promycelium simple, 3–4-septate, each septum producing a single sporidium borne on a slender sterigma.

In some species the head of uredo- and teleutospores is surrounded at the base by paraphyses.

Hemileia, Berk. and Broome, Gard. Chron., Nov. 6, 1869 ; Sacc. Syll., vii., p. 585 (1888).

Hemileia is very closely allied to the genus *Uromyces*, Link, from which it differs mainly in the fertile hyphæ emerging in fascicles solely through the stomata to produce their spores on the surface of the affected part of the host.

Hemileia vastatrix, *Berk. and Broome*, Gard. Chron., Nov. 6, 1869, p. 1157, 1 fig..

I. Unknown.

II. Hypophyllous ; commencing as small irregularly circular patches ; if numerous, the patches during increase in size blend together, and not unfrequently cover the greater portion of the leaf ; uredospores produced in small heads, subreniform, triangular in section, the free convex surface covered with small warts, and bounded by a row of longer, crowded, spinose warts ; the two lateral surfaces that are in contact with adjoining spores, smooth, 30—40 × 28—30 μ ; pedicel slender, short ; germ-pores 3–5 ; germ-tube elongated, with one or more vesiculose swellings, irregularly branched.

III. Teleutospores occupying the centre of the heads of uredospores, broadly depressed-ovate, umbonate ; epispore smooth, contents orange, averaging 30 × 25 μ ; pedicel slender, short ; promycelium tube simple, 3–4-septate, each segment giving origin to a single subglobose sporidium 8 — 10 μ diameter, borne at the apex of a slender sterigma.

Hemileia vastatrix, Berk. and Broome, Linn. Soc. Journ. (Bot.) XIV., 1875, p. 93 ; Sacc. Syll. n. 2102, p. 585 (1888).

Hemileia Canthii, Berk. and Broome, Linn. Soc. Journ. (Bot.) XIV., 1875, p. 93 ; Sacc. Syll. n. 2104, p. 586 (1888).

The fungus is most abundant on the under surface of living leaves, less frequently on young shoots or young fruit.

CEYLON. *Coffea arabica*, L. (cultivated) ; *Plectronia campanulata*, Beddome ; *Coffea travancorensis*, Wight and Arn.

INDIA. *Coffea arabica*, L. (cultivated), Mysore ; *Coffea travancorensis*, Wight and Arn., Travancore.

CHINA. *Coffea arabica*, L., and *C. liberica*, Hiern (cultivated) ; *Gardenia jasminoides*, Ellis.

JAVA.
SUMATRA.
MALACCA.
SINGAPORE.
} *Coffea arabica*, L., and *C. liberica*, Hiern (cultivated).

PHILIPPINES. *Coffea arabica*, L., and *C. liberica*, Hiern (cultivated).

SAMOAN ARCHIPELAGO. *Coffea arabica*, L. (cultivated).

FIJI. *Coffea arabica*, L. (cultivated).

MAURITIUS. *Coffea arabica*, L. (cultivated).

MADAGASCAR. *Coffea arabica*, L. (cultivated).

AFRICA. *Coffea arabica*, L., Natal and German East Africa (cultivated); *Coffea arabica*, L., var. *Stuhlmannii*, Warb., near Bukoba, Victoria Nyanza; *Craterispermum laurinum*, Benth., Tropical Africa.

Somewhat variable in appearance on different hosts; and although the uredospores vary considerably within certain limits they always retain the reniform shape, and warted convex portion of the epispore surrounded by a row of longer spinulose warts.

Hemileia Woodii, *Kalchbr. and Cooke*, Grevillea, Vol. IX., 1880, p. 22.

I. Unknown.

II. Hypophyllous; uredospores aggregated in small heads, forming somewhat irregularly defined pulverulent orange patches 1–2 cm. across; spores broadly elliptical or subglobose, those situated near the periphery of the head often show a slight concavity on the surface in contact with other spores; epispore thickly studded with small warts of uniform size; averaging about 30 μ diameter; pedicel slender.

III. Teleutospores occupying the centre of the heads of uredospores, almost or quite colourless, broadly ovate, umbonate; epispore smooth, averaging 35 μ diameter; pedicel elongated, rather stout, septate; promycelium tube simple, 3–4-septate, each segment producing a subglobose sporidium 8—10 μ diameter, borne at the apex of a slender sterigma. The head of spores is surrounded by a varying number of slightly curved, smooth paraphyses, which are more or less triangular in section.

Hemileia Woodii, Kalchbr. and Cooke, Sacc., Syll. Fung., Vol. VII., n. 2103, p. 586 (1888); Zeitschr. Trop. Landw. der Tropenpfl., n. 8, 1897, p. 192.

AFRICA. Natal; on living leaves of *Vangueria infausta*, Burch., *V. latifolia*, Sond., *V. euonymoides*, Schweinf.

Near Bukoba, Kilimandscharo, on living leaves of *Vangueria madagascarensis*, J. F. Gmel.

Lindi, German East Africa, on living leaves of *Coffea Ibo*, Froehner.

JAVA. On living leaves of various species of *Gardenia*, Buitzenzorg Botanic Garden.

QUEENSLAND. On living leaves of *Gardenia edulis*, F. v. Muell.; Gilbert River.

The paraphyses or cysts forming the outermost and basal portion of the head of spores are very variable in number and size, but can always be found, even when all the spores are mature; whereas in *H. vastatrix*, bodies similar in appearance, and occupying a like position, are present when the head is forming, but eventually develop into normal spores.

The teleutospores are more abundant in proportion to the uredospores in the present species than they are in *H. vastatrix*.

Hemileia americana, *Massee*. Gard. Chron., 1905, p. 153, fig. 53.

I. Unknown.

II. Hypophyllous; forming broadly effused pulverulent, deep orange-coloured patches, often several centimetres in extent; spores shortly stipitate, perfectly spherical; epispore bearing small, rather sparsely scattered, round warts, 24 — 32 μ diameter; germ-pores two; germ-tubes cylindrical, bearing a few short branches.

III. The teleutospores occupy the central portion of the heads of uredospores, shortly stipitate, colourless, broadly obovate or turbinate, often with a small, obtuse, apical umbo; epispore closely covered with minute warts, averaging 30 × 25 μ.

COSTA RICA. On living leaves of *Cattleya dowiana*, Batem.

Only a small patch of rust was present on one leaf when the plant was received from Costa Rica, but this has continued to increase in size, and the falling spores have also inoculated other leaves.

The spores germinate readily, usually within 24 hours in various nutrient solutions, perhaps best in a very dilute decoction of dung. The inflated portions of the germ-tube, so characteristic of *H. vastatrix*, have not been observed in the present species. Young leaves of *Cattleya dowiana*, Batem., inoculated on the under surface with uredospores, produced mature uredospores 13 days after inoculation. Hitherto no success has attended the attempt to inoculate orchids belonging to other genera than *Cattleya*, neither has success attended the many attempts to inoculate *Cattleya* leaves with secondary spores produced by germinating teleutospores.

The mycelium is very abundant in the tissues; haustoria are absent.

Hemileia indica, *Massee*.

I. Unknown.

II. Hypophyllous; forming scattered, circular, pulverulent orange patches 3–5 mm. across; spores orange; epispore crowded with minute warts, spherical, with a broad circular hilum or point of attachment to the pedicel, averaging 25 μ diameter; pedicel longer than the diameter of the spore, 10 μ thick, 3-septate hyaline; germination unknown.

III. Teleutospores occupying the central portion of the clusters of uredospores, broadly obovate to subglobose, hyaline ; epispore smooth, averaging 18 — 20 μ diameter ; germination unknown.

INDIA. Belgaum, Bombay ; on living leaves of an undetermined species of *Macropanax* (*Major-Gen. Hobson*).

The following bibliography, chronologically arranged, embraces those contributions of primary importance relating to the genus *Hemileia*, and more especially from the standpoint of a destructive parasitic disease :—

Berkeley, *M. J.*, Coffee plant disease ; Gard. Chron., Nov. 6, 1869.

Cooke, *M. C.*, Report on diseased Coffee leaves ; India—Museum Report, 1876, p. 4 (descr. and fig.).

Abbay, *R.*, Observations on *Hemileia vastatrix*, the so-called Coffee disease ; Journ. Linn. Soc. (Bot.) XVII., 1878, p. 172, plates XIII.–XIV.

Morris, *D.*, Reports upon experiments connected with the Coffee leaf disease ; Sessional Paper XII., 1879, Colombo.

The Campaign of 1879 against Coffee leaf disease ; "Ceylon Observer" Press, Colombo, 1879.

Ward, *H. M.*, Coffee leaf disease ; Sessional Paper, 1879, Colombo.

Morris, *D.*, Note on the structure and habit of *Hemileia vastatrix*, the Coffee leaf disease of Ceylon and Southern India ; Journ. Linn. Soc. (Bot.) XVII., 1880, p. 512.

Ward, *H. M.*, Coffee leaf disease ; Sessional Papers, 1880, 1881, Colombo.

Dyer, *W. T. Thiselton-*, The Coffee leaf disease of Ceylon ; Quart. Journ. Micr. Science, N.S., XX., 1880, p. 119, plates IX.–XIV.

Ward, *H. M.*, On the morphology of *Hemileia vastatrix*, Berk. and Br. ; Quart. Journ. Micr. Science, N.S., XXII., 1882, p. 1, plates I.–III.

Coffee leaf disease in Central Africa (Preventive Measures) ; *Kew Bulletin*, 1893, p. 361.

Hemileia vastatrix in German East Africa ; *Kew Bulletin*, 1894, p. 412.

Sadebeck, Einige Beobachtungen und Bemerkungen über die durch Hemileia vastatrix verursachte Blattfleckenkrankheit der Käffeebäume ; Forstl. naturn. Zeitschr., 1895, p. 340.

Hennings, *P.*, Eine neue Blattfleckenkrankheit (Hemileia Woodii) auf dem Ibo-Kaffee in Deutsch-Ostafrika ; Zeitschr. Trop. Landwirtschaft der Tropenpflanzer, No. 8, 1897, p. 192.

DESCRIPTION OF THE FIGURES.

1. Uredospores of *Hemileia vastatrix*, Berk. and Broome, in various positions ; × 400.

2. Uredospore of same, germinating ; × 400.

3. Teleutospore of same ; × 400.

4. Uredospores of *Hemileia Woodii*, Kalchbr. and Cooke ; × 400.

5. Teleutospore of same ; × 400.

6. Teleutospore of same, germinating ; × 400.

6A. One of the paraphyses surrounding head of spores of same ; × 400.

7. Patches of *Hemileia americana*, Massee, on portion of a leaf of *Cattleya dowiana*, Batem., nat. size.

8. Section through a leaf *a* above showing the mycelium emerging in a fascicle through a stoma, and bearing a head of uredo- and teleutospores ; × 400.

9. Uredospores of same, one is germinating ; × 400.

10. Teleutospore of same ; × 400.

11. Intercellular mycelium of same ; × 1,000.

12. Uredospore of *Hemileia indica*, Massee ; × 400.

GEO. MASSEE.

V.—THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW.

The publication of this work has long been delayed by unavoidable circumstances. It has now been issued as additional Series V. of the *Kew Bulletin* (pp. 223, with a plate). The late Director has contributed the following preface :—

"'Kew, as it exists to-day, was formed by the fusion of two distinct properties or domains, both Royal, but with entirely different histories. They correspond roughly to the west and east halves of the present gardens. The western half was known as Richmond Gardens. The eastern half corresponds in great part to the grounds of Kew House, and to this the name of Kew Gardens was originally confined. The two properties were separated by Love Lane, the ancient bridle road between Richmond and Brentford Ferry.' (*Kew Bulletin*, 1891, p. 281.)

"Richmond Lodge or House had been granted in 1707 by Queen Anne to the Duke of Ormonde. It was purchased from his family by George II. when Prince of Wales. It was a favourite residence of Queen Caroline, and was ultimately pulled down by George III. about 1771.

"Kew House had been the residence of Lord Capel of Tewkesbury, a brother of the Earl of Essex. It was leased by Frederick, Prince of Wales, and was the home of his widow, the Princess Augusta of Saxe-Gotha, till her death. In 1759 she commenced the scientific history of Kew by establishing a Botanic or, as it was then called, a Physic Garden. George III. acquired the property, and in 1803 pulled down Kew House also. He obtained two Acts of Parliament empowering him to close Love Lane, but this was apparently not finally accomplished till 1802.

"The area of the Gardens as they at present exist is something under half a square mile. While the western half shows for the most part little evidence of the soil having been ever disturbed by cultivation, beyond being thickly planted with trees, this is not the case with the eastern half, much of which has at one time or another apparently been brought under the plough.

"In 1873 a member of the Kew staff (Curator from 1886 to 1901), Mr. George Nicholson, F.L.S., compiled a list of the native (and a few naturalised) plants occurring spontaneously at Kew. This was published in the *Journal of Botany* for 1875. Mr. R. I. Lynch, Curator of the Botanic Garden, Cambridge, also formerly a member of the Kew staff, materially contributed to its completeness from his own observations, and the late Lord de Tabley, better known to botanists as the Hon. John Leicester Warren, was keenly interested in it.

"In the *Kew Bulletin* for 1897 (pp. 115–167) a first attempt was made to catalogue the Mycologic Flora by Mr. G. Massee, F.L.S., a Principal Assistant in the Herbarium. The following passage is quoted from the prefatory note :—

"'Of the Royal Gardens themselves some 100 acres is little disturbed by any kind of cultivation, and it has certainly remained so for at least a century and a half. Some portions may never possibly have been subjected to cultivation at all. It is not surprising therefore that in the background of horticultural treatment there still subsists a wild fauna and flora of no inconsiderable dimensions. This, as opportunity offers, it is proposed to work out and catalogue from time to time.'

"The Moss Flora was contributed to the *Bulletin* for 1899 (pp. 7–17) by Mr. E. S. Salmon, F.L.S.

"Meanwhile Mr. Nicholson had steadily devoted his leisure hours to the comprehensive scheme contemplated in 1897. He enlisted the assistance of a number of scientific friends, specialists in various groups, to whom he communicated his enthusiasm for the work and without whose efficient help it would, even in a tentative form, have been impossible of achievement.

"I looked forward to this in Mr. Nicholson's hands with much interest and satisfaction. Unhappily, the breakdown of his health and his consequent retirement from the post of Curator in 1901 compelled him to abandon a labour to which he no longer felt equal. As there was no immediate chance of anyone carrying it on with Mr. Nicholson's energy, I decided to publish the material he had accumulated as at any rate a starting point for further

research. I placed the papers in the hands of Mr. Pearson, M.A., F.L.S., who in the same year had been appointed an Assistant. He succeeded in preparing them for, and partially seeing them through the press when he in turn was obliged to abandon the task owing to his leaving for Cape Colony in 1903 to take up his duties as Professor of Botany in the South African College. Failing other assistance, I found it impossible to carry it to completion till I had myself been relieved of administrative duties.

"It appears to me that it is of considerable interest to show what a vast number of forms of life of the most varied kind may exist together on what is relatively a microscopic speck of the earth's surface. This would be in the present case even more striking if the enumeration were more complete than it can pretend to be. Some groups have not been worked at all; this is the case with the *Diptera*, and of the *Hemiptera* only the *Coccidæ* have been catalogued. Others, it is obvious, have been only touched superficially. The publication of what has been done may encourage working naturalists to correct errors and to accomplish, as perhaps has never been done yet, a complete census of every form of life occurring spontaneously in a small but well defined area.

"I am glad to take the opportunity of acknowledging gratefully the assistance which has been given to those who have successively had a hand in the work by a very large number of individual workers in various branches of zoology and botany. Some of the most important are enumerated in the following 'Table of Contents.' I see from the mass of correspondence which has accumulated that there are a host of others, many personally unknown to me, who have cheerfully rendered the assistance which has been demanded of them on special points. I find it impracticable to specify them all individually, and can only beg them collectively to accept my appreciation of their aid.

"W. T. THISELTON-DYER.

"Kew, February, 1906."

"The abbreviations used are as follows:

"A. Arboretum. This includes the whole of what was formerly termed 'pleasure grounds.'

"B. Botanic garden. This division was formerly separated from the arboretum by a wire fence, which ran near Unicorn Gate, by north end of Pagoda vista, along eastern side of ash collection to Palace lawn.

"P. Palace and herbarium grounds.

"Q. Queen's Cottage grounds.

"R. Rock-garden.

"Strip. This is the piece of ground between the wall and the Thames, extending from end of herbarium grounds to the end of Queen's Cottage grounds."

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VI.—NEW AND ADDITIONAL SPECIES OF FUNGI OCCURRING IN THE ROYAL BOTANIC GARDENS, KEW.

(*With Plate.*)

As might have been expected the enumeration of the Fungi detected in the Royal Botanic Gardens, Kew, given by Mr. George Massee, F.L.S., in the *Wild Fauna and Flora* (pp. 103–184), although very extensive, has not by any means proved exhaustive. The following are undescribed and additional species which have been observed since the enumeration was in type :—

Dasyscypha abscondita, *Massee* (sp. nov.). (Figs. 1–6).

Ascomata 1·5–2 mm. alta, 1 mm. lata, gregaria, primo globosa dein cupulata, stipitata, extus margineque pilosa, albida ; pilis hyalinis, septatis, clavatis, 60–80 × 7–10 μ. *Asci* cylindracei, octospori, 50 × 6–7 μ. *Sporae*, hyalinae, ellipsoideae, 5 × 2 μ. *Paraphyses* filiformes.

Gregarious on fading grass growing under a cask, Queen's Cottage Grounds. G. Nicholson.

Characterized by the small spores, and the clavate hairs of the ascophore. Most closely allied to *D. candidata*, Cooke.

Marasmius opalinus, *Massee* (sp. nov.). (Figs. 7–11).

Pileus primo hemisphærico-globosus, dein applanato-hemisphæricus, centro late profundeque umbilicatus, margine incurvus et striatulus, integer, membranaceus, tenacellus, rufescens disco obscuriore, glaberrimus. *Lamellae* remotae, strictissimae, utrinque attenuatae, membranaceae, opalino-albidae. *Stipes* longiusculus, gracilis, teres, deorsum vix incrassatus, glaberrimus, candidus. *Sporae* hyalinae, ellipsoideae, deorsum lateraliter acutatae, 10—11 × 6 μ.

In the Fern house, on wood received from Jamaica.

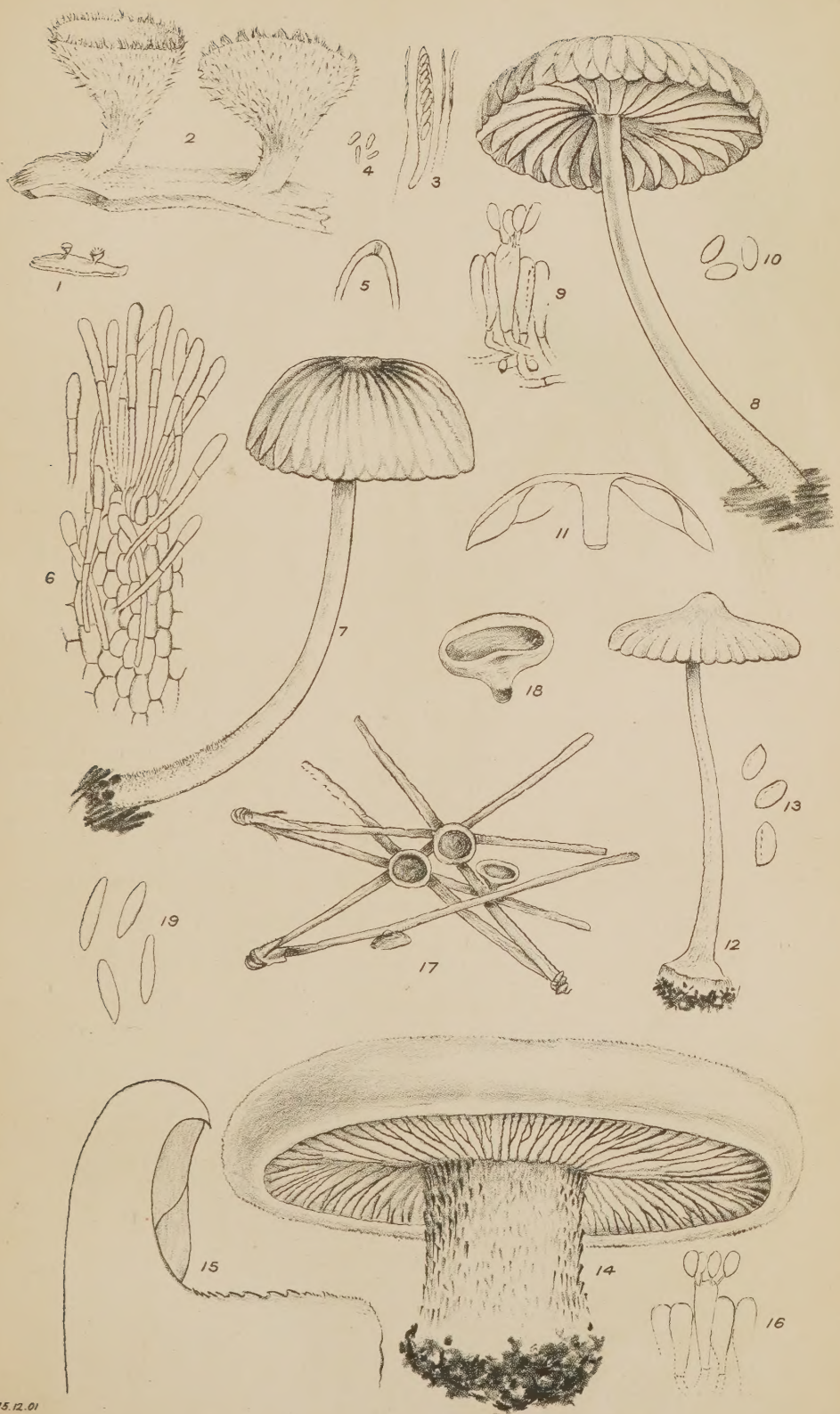
Pileus 3–4 cm. broad ; stem 6–8 cm. long. Very remarkable on account of the opalescent or iridescent tints of the thin, white gills.

Bolbitius umbonatus, *Massee* (sp. nov.). (Figs. 12–13).

Pileus tenuiter carnoso-membranaceus, subpellucidus, e conico campanulatus dein explanatus, umbonatus, profunde sulcatus glaberrimus, laete flavo-brunneus pallescens. *Lamellae* adnexae, latae, subdistantes, acie integrae, ferrugineo-flavae. *Stipes* sursum attenuatus, albus, basi marginato-bulbosus. *Sporae* ellipsoideae, ochraceae, 10 × 5–6 μ ; basidia spathulata, 23–25 × 10–12 μ.

Gregarious on tan in the propagating pits.

This fine species approaches *B. bulbillosus*, Fr., in the distinctly marginate bulb, differing however in its larger size, coarsely sulcate pileus, and white stem. Probably an introduced species.



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New British Fungi.

Tricholoma saevum, *Gillet.* (Figs. 14–16).

A species that has in all probability been passed over as a form of *T. personatum*, Fr., from which it differs in the fleshy pileus becoming plane, incurved margin glabrous from the first, absence of violet colour in the gills, and very short, stout, violet, squamulose stem.

Previously recorded from Sweden and France.

Among grass, Herbarium grounds.

Humaria pinetorum, *Fckl.* (Figs. 17–19).

This interesting fungus has been collected on fallen pine leaves in the Arboretum. G. Nicholson. Hitherto only recorded from Germany.

DESCRIPTION OF THE FIGURES.

1. *Dasyscypha abscondita ;* nat. size.
2. „ „ ; × 40.
3. Ascus, spores, and paraphyses ; × 400.
4. Free spores ; × 400.
5. Apex of ascus ; × 1,200.
6. Cortical cells and external hairs ; × 400.

7–8. *Marasmius opalinus ;* nat. size.

9. Basidia and spores ; × 400.
10. Free spores ; × 400.
11. Section of pileus ; nat. size.
12. *Bolbitius umbonatus ;* nat. size.
13. Spores ; × 400.
14. *Tricholoma saevum ;* nat. size.
15. Section of pileus ; nat. size.
16. Basidia and spores ; × 400.
17. *Humaria pinetorum*, Fckl. ; nat. size.
18. Single plant ; × 8.
19. Free spores of same ; × 400.

VII.—MISCELLANEOUS NOTES.

Visitors during 1905.—The number of persons who visited the Royal Botanic Gardens during the year 1905 was 1,824,319. That for 1904 was 1,579,666. The average for 1895–1904 was 1,334,549. The total number on Sundays was 853,631, and on week-days 970,688. The maximum number on any one day was 61,183 on August 7, and the smallest 70 on December 11.

The detailed monthly returns are given below :—

January	29,876
February	34,310
March	64,825
April	166,910
May	245,714
June	302,427
July	345,996
August	286,542
September	234,183
October	65,347
November	25,253
December	22,936

Mr. Kenneth George Burbridge, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Curator of the Botanic Station at Kumasi, Ashanti, a branch station recently established in connection with the Botanical and Agricultural Department of the Gold Coast.

Mr. Edgar W. Foster, formerly a member of the gardening staff of the Royal Botanic Gardens, and late Curator of the Botanic Station, Lagos, has been appointed by the Secretary of State for the Colonies, Assistant Conservator of Forests in the Colony.